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<u>L13</u>	l2 and l4 and l6 and l8	18	<u>L13</u>
<u>L12</u>	L9 and l7 and (l3 or graft copolymer) and l2	2	<u>L12</u>
<u>L11</u>	L9 and l7 and (l4 or graft copolymer.ti,clm.) and l2	1	<u>L11</u>
<u>L10</u>	L9 and l7 and l4 and l2	1	<u>L10</u>
<u>L9</u>	\$phosphate.ti,clm. same (flame retard\$ or fire retard\$ or flame resis\$ or fire resist\$).ti,clm.	780	<u>L9</u>
<u>L8</u>	\$phosphate same (flame retard\$ or fire retard\$ or flame resis\$ or fire resist\$)	4745	<u>L8</u>
<u>L7</u>	(wollastonite or calcium silicate or calcium metasilicate).ti,clm.	2130	<u>L7</u>
<u>L6</u>	wollastonite or calcium silicate or calcium metasilicate	14166	<u>L6</u>
<u>L5</u>	wollastonite or clcium silicate or calcium metasilicate	5173	<u>L5</u>
<u>L4</u>	(abs or acrylonitrile butadiene near styrene).ti,clm.	7908	<u>L4</u>
<u>L3</u>	abs or acrylonitrile butadiene near styrene	121293	<u>L3</u>
<u>L2</u>	(polycarbonate or polyester carbonate).ti,clm.	15469	<u>L2</u>
<u>L1</u>	polycarbonate or polyester carbonate	88091	<u>L1</u>

END OF SEARCH HISTORY

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L13: Entry 10 of 18

File: USPT

Jan 16, 2001

US-PAT-NO: 6174944

DOCUMENT-IDENTIFIER: US 6174944 B1

TITLE: Polycarbonate resin composition, and instrument housing made of it

DATE-ISSUED: January 16, 2001

US-CL-CURRENT: 524/127; 524/141, 524/145, 524/270, 524/482, 524/490APPL-NO: 09/ 280723 [PALM]

DATE FILED: March 30, 1999

## FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	10-138700	May 20, 1998

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L13: Entry 9 of 18

File: USPT

May 15, 2001

DOCUMENT-IDENTIFIER: US 6231788 B1

TITLE: Carbon-reinforced PC-ABS composition and articles made from sameBrief Summary Text (24):

In addition to carbon fibers as described above, the compositions of the invention may include additional fillers. Non-limiting examples of other fillers which may be included are glass fibers, mica, talc, clay and wollastonite. Minor amounts of other materials can also be included to modify specific properties of the composition. For example, polytetrafluoroethylene (PTFE) in amounts of up to about 1% could be included as part of a flame retardant package. Other types of flame retardant packages including brominated flame retardant polymers (e.g., brominated PC) or phosphorus-containing organic flame retardants (such as resorcinol diphosphate, bisphenol A diphosphate or tetraxyl piperazine diphosphamide) can also be included in effective amounts up to about 20%. PTFE could also be included in larger amounts, up to about 25%, to improve wear resistance; and polyethylene could be included in amounts up to about 2% to improve mold release characteristics. Impact modifiers such as styrene-butadiene-styrene (SBS) can be included in amounts up to about 10% to further improve impact strength. Flow promoters such as hydrogenated polyterpene can also be included in amounts up to about 10%.

## CLAIMS:

1. A composition comprising:

(a) a thermoplastic resin comprising a blend of polycarbonate and acrylonitrile-butadiene-styrene copolymer; and

(b) carbon fibers associated into bundles with a polyamide terpolymer binder, said bundles being dispersed within the thermoplastic resin.

6. The composition of claim 1, wherein the blend comprises polycarbonate and acrylonitrile-butadiene-styrene copolymer in a ratio of from 10:90 to 90:10, by weight.

9. A method for making an injection-molded article comprising the steps of:

(a) preparing a composition comprising a thermoplastic resin comprising a blend of polycarbonate and acrylonitrile-butadiene-styrene copolymer, and carbon fibers associated into bundles with a polyamide terpolymer binder, said bundles being dispersed within the thermoplastic resin;

(b) heating the composition to melt the thermoplastic resin; and

(c) injecting the heated composition into a mold shaped to form the article.

12. The method of claim 9, wherein the blend comprises polycarbonate and acrylonitrile-butadiene-styrene copolymer in a ratio of from 10:90 to 90:10 by weight.

13. An injection-molded article prepared by a method comprising the steps of:

(a) preparing a composition comprising a thermoplastic resin comprising a blend of

polycarbonate and acrylonitrile-butadiene-styrene copolymer, and carbon fibers associated into bundles with a polyamide terpolymer binder, said bundles being dispersed within the thermoplastic resin;

(b) heating the composition to melt the thermoplastic resin; and

(c) injecting the heated composition into a mold shaped to form the article.

16. The article of claim 13, wherein the blend comprises polycarbonate and acrylonitrile-butadiene-styrene copolymer in a ratio of from 10:90 to 90:10 by weight.

17. A method for increasing the impact strength of a PC-ABS blend having carbon fibers dispersed therein, comprising the step of coating the carbon fibers with a polyamide terpolymer binder prior to dispersing them in the PC-ABS blend.

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L13: Entry 8 of 18

File: USPT

Mar 26, 2002

DOCUMENT-IDENTIFIER: US 6362269 B1

TITLE: Resin composition

Brief Summary Text (85):

As the fibrous filler (B-1 component), there can be mentioned, for example, a glass fiber, a milled glass fiber, wollastonite, a carbon fiber, a metal-based electroconductive fiber, and whiskers such as potassium titanate whiskers, aluminum borate whiskers and the like. Of these, preferred are a glass fiber, wollastonite, a carbon fiber and a metal-based electroconductive fiber; most preferred are a glass fiber, wollastonite and a carbon fiber.

Brief Summary Text (90):

The wollastonite used as the B-1 component is a natural white mineral of needle-like crystals, composed mainly of calcium silicate, and is substantially represented by  $\text{CaSiO}_3$ . It ordinarily contains about 50% by weight of  $\text{SiO}_2$ , about 47% by weight of CaO and the remainder of  $\text{Fe}_2\text{O}_3$ ,  $\text{Al}_2\text{O}_3$ , etc, and has a specific gravity of about 2.9. Preferably used is a wollastonite in which in the particle diameter distribution, particles having diameters of 3  $\mu\text{m}$  or more is 75% or more and particles having diameters of 10  $\mu\text{m}$  or more is 5% or less and which has an aspect ratio (L/D) of 3 or more, particularly 8 or more. When the particles having diameters of 3  $\mu\text{m}$  or more, in the particle diameter distribution is 75% or more, sufficient reinforcing effect and higher rigidity are obtained. When the particles having diameters of 10  $\mu\text{m}$  or more is 5% or less, good impact strength is obtained and the molded article obtained have better surface appearance. Particularly when the aspect ratio is 8 or more, sufficient reinforcing effect and higher rigidity are obtained. A wollastonite having an aspect ratio of 50 or less is more preferred in view of the working environment. The wollastonite may be surface-treated with an ordinary surface-treating agent, for example, a coupling agent such as a silane coupling agent later described, a titanate-based coupling agent or the like.

Brief Summary Text (124):

To the resin composition of the present invention can be added a flame retardant in order to allow the composition to have flame retardancy. As the flame retardant, there can be mentioned a halogenated bisphenol A polycarbonate type flame retardant, an organic salt type flame retardant, an aromatic phosphoric acid ester type flame retardant, a halogenated aromatic phosphoric acid ester type flame retardant, etc. At least one kind selected from these flame retardants can be blended. Specific examples of the halogenated bisphenol A polycarbonate type flame retardant are flame retardants of polycarbonate of tetrachlorobisphenol A, copolycarbonate of tetrachlorobisphenol A and bisphenol A, polycarbonate of tetrabromobisphenol A, and copolycarbonate of tetrabromobisphenol A and bisphenol A. Specific examples of the organic salt type flame retardant are dipotassium diphenylsulfone-3,3'-disulfonate, potassium diphenylsulfone-3-sulfonate, sodium 2,4,5-trichlorobenzenesulfonate, potassium 2,4,5-trichlorobenzenesulfonate, potassium bis(2,6-dibromo-4-cumylphenyl) phosphate, sodium bis(4-cumylphenyl) phosphate, potassium bis(p-toluenesulfone)imide, potassium bis(diphenylphosphoric acid)imide, potassium bis(2,4,6-tribromophenyl) phosphate, potassium bis(2,4-dibromophenyl) phosphate, potassium bis(4-bromophenyl) phosphate, potassium diphenyl phosphate, sodium diphenyl phosphate, potassium perfluorobutanesulfonate, sodium or potassium lauryl sulfate, and sodium or potassium hexadecyl sulfate. Specific examples of the halogenated aromatic phosphoric acid ester type flame retardant are

tris(2,4,6-tribromophenyl) phosphate, tris(2,4-dibromophenyl) phosphate and tris(4-bromophenyl) phosphate. Specific examples of the aromatic phosphoric acid ester type flame retardant are triphenyl phosphate, tris(2,6-xylyl) phosphate, tetrakis(2,6-xylyl)resorcin diphosphate, tetrakis(2,6-xylyl)hydroquinone diphosphate, tetrakis(2,6-xylyl)-4,4'-biphenol diphosphate, tetraphenylresorcin diphosphate, tetraphenylhydroquinone diphosphate, tetraphenyl-4,4'-biphenol diphosphate, aromatic polyphosphate of which the aromatic ring sources are resorcin and phenol and which contains no phenolic OH group, aromatic polyphosphate of which the aromatic ring sources are resorcin and phenol and which contains phenolic OH group, aromatic polyphosphate of which the aromatic ring sources are hydroquinone and phenol and which contains no phenolic OH group, aromatic polyphosphate of which the aromatic ring sources are hydroquinone and phenol and which contains phenolic OH group, ("aromatic polyphosphates" shown below refer to both of aromatic polyphosphates containing phenolic OH group and aromatic polyphosphates containing no phenolic OH group), aromatic polyphosphates of which the aromatic ring sources are bisphenol A and phenol, aromatic polyphosphates of which the aromatic ring sources are tetrabromobisphenol A and phenol, aromatic polyphosphates of which the aromatic ring sources are resorcin and 2,6-xylenol, aromatic polyphosphates of which the aromatic ring sources are hydroquinone and 2,6-xylenol, aromatic polyphosphates of which the aromatic ring source are bisphenol A and 2,6-xylenol, and aromatic polyphosphates of which the aromatic ring sources are tetrabromobisphenol A and 2,6-xylenol.

Brief Summary Text (125):

Of these flame retardants, preferred as the halogenated bisphenol A polycarbonate type flame retardant are those of polycarbonate of tetrabromobisphenol A and copolycarbonate of tetrabromobisphenol A and bisphenol A, and the polycarbonate of tetrabromobisphenol A is more preferred. Preferred as the organic salt type flame retardant are dipotassium diphenylsulfone-3,3'-disulfonate, potassium diphenylsulfone-3-sulfonate and sodium 2,4,5-trichlorobenzenesulfonate; preferred as the aromatic phosphoric acid ester type flame retardant are triphenyl phosphate, tricresyl phosphate, cresyl diphenyl phosphate and resorcinol bis(dixylenyl phosphate).

Brief Summary Text (128):

Further, there can also be used inorganic flame retardants such as inorganic phosphate [e.g. poly(ammonium phosphate)], aluminum hydroxide, magnesium hydroxide, dolomite, hydrotalcite, calcium hydroxide, barium hydroxide, basic magnesium carbonate, zirconium hydroxide, hydrate of inorganic metal compound (e.g. tin oxide hydrate), zinc borate, zinc metaborate, barium metaborate, zinc carbonate, magnesium carbonate, calcium carbonate, barium carbonate, magnesium oxide, molybdenum oxide, zirconium oxide, tin oxide, antimony oxide and the like.

Brief Summary Text (129):

As the flame retardant of the present invention, there can further be mentioned metal sulfides such as sulfides of group IIA elements, sulfides of group IIB elements, tin sulfide, iron sulfide, titanium sulfide, copper sulfide, bismuth sulfide and the like; element-sulfur; borates of group IA elements; phosphates of group IA elements; borates of group IIA elements; phosphates of group IIA elements; borophosphates of group IIA elements; borates of group IIB elements; phosphates of group IIB elements; borophosphates of group IIB elements; phosphates of group IVB elements; and metal phosphates such as aluminum phosphate, iron phosphate, bismuth phosphate, tin phosphate, zirconium phosphate, titanium phosphate and the like.

Detailed Description Text (65):

(3) Wollastonite: Sicatec NN-4, a product of Tomoe Engineering Co., Ltd., average particle diameter  $D=4\text{ }\mu\text{m}$ , distribution of particles having particle diameters of  $3\text{ }\mu\text{m}$  or more=82.5%, distribution of particles having particle diameters of  $10\text{ }\mu\text{m}$  or more=0.7%, aspect ratio  $L/D=20$  (abbreviated to "W" in some cases).

Detailed Description Text (79):

As is apparent from Table 3, the aromatic polycarbonate resin compositions of Examples of the present invention, which were composed of an aromatic polycarbonate resin having a relative fluorescence intensity and wollastonite are superior in those properties primarily expected for wollastonite-containing resin compositions

and further, superior in wet heat fatigue and impact resistance of flat in particular, as compared with the resin composition of Comparative Example 4 using an aromatic polycarbonate resin having a high relative fluorescence intensity.

#### Detailed Description Text (97):

As is apparent from Table 9, by adding an inorganic filler such as glass fiber, wollastonite, talc or the like to a thermoplastic resin composition of the present invention, further improvements in rigidity and wet heat fatigue are obtained while chemical resistance and impact strength are retained. Even when an inorganic filler is added to thermoplastic resin compositions composed of an aromatic polyester resin and an aromatic polycarbonate resin of Comparative Examples of Table 9, whose relative fluorescence intensity was outside of the range of present invention, improvement in wet heat fatigue is small and, moreover, impact strength and chemical resistance are also low. Thus, it is apparent that the present invention can give large effect in improvement.

#### Detailed Description Paragraph Table (3):

TABLE 3	Ex.7	Ex.8	Ex.9	C.Ex.1	C.Ex.4	composition (a)	EX-PC parts by 100	100	100	100
weight CEX-PC parts by 100 weight (e) wollastonite parts by 20	50	80	50	weight						
properties relative fluorescence	--	1.0	.times. 10.sup.-3	1.0	.times. 10.sup.-3	1.0	.times. 10.sup.-3	1.0	.times. 10.sup.-3	1.0
intensity residual										
catalytic %	0.03	0.03	0.03	0.03	3.1	activity index	terminal hydroxyl mole %	6	6	6
50 group concentration wet heat fatigue-(I)	times 1.0	.times. 10.sup.4	3.5	.times. 10.sup.4	3.5	.times. 10.sup.4	3.5	.times. 10.sup.4	3.5	.times. 10.sup.4
resistance of cm	15	30	35	80	25	flat tensile strength kgf/cm.sup.2	450	640	720	630
610 rigidity kgf/cm.sup.2	51,000	76,000	91,000	22,000	75,000	notched impact kgfcm/cm				
7 8 9 85 5 Ex.: Example						C.Ex.: Comparative Example				

#### CLAIMS:

1. A resin composition composed substantially of (1) 100 parts by weight of a resin component selected from: (a) an aromatic polycarbonate resin (A-1 component) obtained by melt polymerization and, when measured for fluorescent spectrum at an exciting wavelength of 320 nm, having a relative fluorescence intensity of 4.times.10.sup.-3 or less at 465 nm relative to a standard substance, (b) a resin mixture composed of 10 to 90 parts by weight of said aromatic polycarbonate resin (A-1 component) and 90 to 10 parts by weight of a styrene-based resin (A-2 component), or (c) a resin mixture composed of 10 to 90 parts by weight of said aromatic polycarbonate resin (A-1 component) and 90 to 10 parts by weight of an aromatic polyester resin (A-3 component), and (2) 5 to 200 parts by weight of at least one kind of reinforcing filler selected from the group consisting of a fibrous filler (B-1 component) and a platy filler (B-2 component).
2. A resin composition according to claim 1, wherein the aromatic polycarbonate resin (A-1 component) has a residual catalytic activity index of 2% or less.
3. A resin composition according to claim 1, wherein the aromatic polycarbonate resin (A-1 component) has a relative fluorescence intensity of 3.times.10.sup.-3 or less.
5. A resin composition according to claim 1, wherein the styrene-based resin (A-2 component) is at least one kind of resin selected from the group consisting of a polystyrene, a high-impact polystyrene (HIPS), an acrylonitrile-styrene copolymer (AS resin), a methyl methacrylate-butadiene-styrene copolymer (MBS resin) and an acrylonitrile-butadiene-styrene copolymer (ABS resin).
7. A resin composition according to claim 1, wherein the resin component is the aromatic polycarbonate resin (A-1 component).
8. A resin composition according to claim 1, wherein the resin component is composed of 40 to 90 parts by weight of the aromatic polycarbonate resin (A-1 component) and 60 to 10 parts by weight of the styrene-based resin (A-2 component).
9. A resin composition according to claim 1, wherein the resin component is composed of 20 to 80 parts by weight of the aromatic polycarbonate resin (A-1 component) and



80 to 20 parts by weight of the aromatic polyester resin (A-3 component).

11. A resin composition according to claim 1, wherein the fibrous filler (B-1 component) is at least one kind of filler selected from the group consisting of a glass fiber, a carbon fiber and wollastonite.

14. A resin composition composed substantially of (a) 10 to 90 parts by weight of an aromatic polycarbonate resin (A-1 component) obtained by melt polymerization and, when measured for fluorescent spectrum at an exciting wavelength of 320 nm, having a relative fluorescence intensity of  $4 \times 10^{-3}$  or less at 465 nm relative to a standard substance, and (b) 90 to 10 parts by weight of a styrene-based resin (A-2 component) or an aromatic polyester resin (A-3 component).

15. A resin composition according to claim 14, wherein the aromatic polycarbonate resin (A-1 component) has a residual catalytic activity index of 2% or less.

16. A resin composition according to claim 14, wherein the aromatic polycarbonate resin (A-1 component) has a relative fluorescence intensity of  $3 \times 10^{-3}$  or less.

18. A resin composition according to claim 14, wherein the styrene-based resin (A-2 component) is at least one kind of resin selected from the group consisting of a polystyrene, a high-impact polystyrene (HIPS), an acrylonitrile-styrene copolymer (AS resin), a methyl methacrylate-butadiene-styrene copolymer (MBS resin) and an acrylonitrile-butadiene-styrene copolymer (ABS resin).

20. A resin composition according to claim 14, wherein the resin component is composed of 40 to 90 parts by weight of the aromatic polycarbonate resin (A-1 component) and 60 to 10 parts by weight of the styrene-based resin (A-2 component).

21. A resin composition according to claim 14, wherein the resin component is composed of 20 to 80 parts by weight of the aromatic polycarbonate resin (A-1 component) and 80 to 20 parts by weight of the aromatic polyester resin (A-3 component).

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L13: Entry 7 of 18

File: USPT

May 14, 2002

US-PAT-NO: 6388046

DOCUMENT-IDENTIFIER: US 6388046 B1

TITLE: Flame retardant resin compositions containing phosphoramides, and method for making

DATE-ISSUED: May 14, 2002

US-CL-CURRENT: 528/198; 524/117, 528/196APPL-NO: 09/ 703979 [PALM]

DATE FILED: October 30, 2000

## PARENT-CASE:

This application is a continuation-in-part of application Ser. No. 09/364,915, filed Jul. 8, 1999, now Pat. No. 6,221,939 which is a continuation-in-part of application Ser. No. 09/235,679, filed Jan. 22, 1999, now abandoned, which is a continuation-in-part of application Ser. No. 09/144,687, filed Aug. 31, 1998, now U.S. Pat. No. 5,973,041.

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L13: Entry 6 of 18

File: USPT

Jun 11, 2002

US-PAT-NO: 6403683

DOCUMENT-IDENTIFIER: US 6403683 B1

**\*\* See image for Certificate of Correction \*\***TITLE: Polycarbonate resin composition and molded article

DATE-ISSUED: June 11, 2002

US-CL-CURRENT: 524/115; 528/196, 528/198APPL-NO: 09/ 530186 [PALM]

DATE FILED: April 26, 2000

## FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	10-243012	August 28, 1998
JP	10-310374	October 30, 1998

## PCT-DATA:

APPL-NO	DATE-FILED	PUB-NO	PUB-DATE	371-DATE	102(E)-DATE
PCT/JP99/04611	August 26, 1999	WO00/12629	Mar 9, 2000	Apr 26, 2000	Apr 26, 2000

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L13: Entry 5 of 18

File: USPT

Jul 23, 2002

DOCUMENT-IDENTIFIER: US 6423766 B1

TITLE: Flame-retardant polycarbonate resin composition and electrical and electronic components made by molding the sameBrief Summary Text (44):

For example, inorganic fillers may be added to the polycarbonate resin composition for the purpose of improving the mechanical strength and the durability of the composition. As specific examples of the inorganic fillers, mentioned are glass fibers, carbon fibers, glass beads, glass flakes, carbon flakes, carbon black, calcium sulfate, calcium carbonate, calcium silicate, titanium oxide, alumina, silica, asbestos, talc, clay, mica, quartz powder, etc. The additives include, for example, antioxidants such as hindered phenols, phosphorus compounds (phosphites, phosphates, etc.), amines, etc.; ultraviolet absorbents such as benzotriazoles, benzophenones, etc.; external lubricants such as aliphatic carboxylates, paraffins, silicone oils, polyethylene waxes, etc.; as well as mold-releasing agents, antistatic agents, colorants, etc. Other resins that may be added to the composition of the intention include, for example, polyethylenes, polypropylenes, polystyrenes, AS resins, ABS resins, polymethyl methacrylates, etc.

Detailed Description Text (3):

(1) The materials used in examples and comparative examples are mentioned below. (A) Polycarbonate (PC resin): Toughlon FN1900A (trade name, from Idemitsu Petrochemical; this is bisphenol A-type polycarbonate having a viscosity-average molecular weight of 19000). (B) Composite rubbery graft copolymer: Metablen S-2001 (trade name, from Mitsubishi Rayon; this is methyl methacrylate-alkyl acrylate-dimethylsiloxane copolymer). (C) Halogen-free phosphoric esters: [i] Adekastab PFR (trade name, from Asahi Denka Kogyo; this is phenyl-resorcinol polyphosphate having a phosphorus content of 10.8% by weight). [ii] PX-200 (trade name, from Daihachi Chemical Industry; this is 2,6-dimethylphenyl-resorcinol polyphosphate having a phosphorus content of 9.0% by weight). (D) Polytetrafluoroethylene: Algoflon F5 (trade name, from Montefluos). (E) Bromine-containing flame retardant: BC-52 (trade name, from Greatlakes), hereinafter referred to as BC-52.

## CLAIMS:

1. A flame-retardant polycarbonate resin composition comprising (A) a polycarbonate resin and (B) a composite rubber graft copolymer in a ratio by weight, (A):(B), falling between 99:1 and 92:8, and containing, relative to 100 parts by weight of the sum total of the component (A) and the component (B), (C) from 0.3 to 1.2 parts by weight, in terms of phosphorus, of a halogen-free phosphoric ester, and (D) from 0.01 to 1.0 part by weight of a polytetrafluoroethylene, in which the ratio by weight of the amount of the composite rubbery graft copolymer (B) to the phosphorus content of the halogen-free phosphoric ester (C) falls between 2 and 15, wherein the composite rubbery graft copolymer (B) is prepared by grafting a composite rubber, which has a structure composed of from 1 to 99% by weight of a polyorganosiloxane rubber component and from 1 to 99% by weight of a polyalkyl acrylate rubber components, the two components being so intertwined with each other as not to separate from each other, and has a mean particle diameter of from 0.01 .mu.m to 0.6 .mu.m, with one or more vinyl monomers, wherein said composition contains essentially no inorganic filler and essentially no ABS resin.

2. Electrical and electronic components as made by molding the flame-retardant

polycarbonate resin composition of claim 1.

3. Housings of office automation equipment, or housings of electrical and electronic appliances, as made by molding the flame-retardant polycarbonate resin composition of claim 1.

4. Battery packs as made by molding the flame-retardant polycarbonate resin composition of claim 1.

5. A flame-retardant polycarbonate resin composition consisting essentially of (A) a polycarbonate resin and (B) a composite rubber graft copolymer in a ratio by weight, (A):(B), falling between 99:1 and 92:8, and containing, relative to 100 parts by weight of the sum total of the component (A) and the component (B), (C) from 0.3 to 1.2 parts by weight, in terms of phosphorus, of a halogen-free phosphoric ester, and (D) from 0.01 to 1.0 part by weight of a polytetrafluoroethylene, in which the ratio by weight of the amount of the composite rubbery graft copolymer (B) to the phosphorus content of the halogen-free phosphoric ester (C) falls between 2 and 15, wherein the composite rubbery graft copolymer (B) is prepared by grafting a composite rubber, which has a structure composed of from 1 to 99% by weight of a polyorganosiloxane rubber component and from 1 to 99% by weight of a polyalkyl acrylate rubber components, the two components being so intertwined with each other as not to separate from each other, and has a mean particle diameter of from 0.01 .mu.m to 0.6 .mu.m, with one or more vinyl monomers, wherein said composition contains essentially no inorganic filler and essentially no ABS resin.

6. Electrical and electronic components as made by molding the flame-retardant polycarbonate resin composition of claim 5.

7. Housings of office automation equipment, or housings of electrical and electronic appliances, as made by molding the flame-retardant polycarbonate resin composition of claim 5.

8. Battery packs as made by molding the flame-retardant polycarbonate resin composition of claim 5.

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L13: Entry 4 of 18

File: USPT

Feb 11, 2003

DOCUMENT-IDENTIFIER: US 6518336 B1

TITLE: Flame-retardent resin compositions compring thermoplastic resin, thermotropic liquid crystal polymer, and hoalogen-free phosphazen compound

Brief Summary Text (6):

Halogen-free phosphoric ester compounds have been proposed as flame retardant for thermoplastic resins. Compositions are proposed in which triphenylphosphate/polytetrafluoroethylene (PTFE) or condensable phosphoric ester/PTFE are incorporated in a resin mixture of aromatic polycarbonate and rubber-fortified styrene resin (European Patent No. 174,493 and Dutch Patent No. 8,802,346), in which a crystalline powdery aromatic diphosphate compound is added to a thermoplastic resin (Japanese Unexamined Patent Publication No. 1079/1993 and U.S. Pat. No. 5,122,556), etc. Halogen-free phosphoric ester compounds have the drawback of adversely affecting the mechanical properties and molding processability of thermoplastic resins although capable of imparting a certain degree of flame retardancy to thermoplastic resins. Further, phosphoric ester compounds tend to plasticize a resin and thus are likely to cause dripping (falling of live charcoal during burning), so that a dripping inhibitor such as PTFE is essentially used. Especially the prevention of dripping is required for attaining a V-0 level of flame retardancy in a test according to the flame retardancy test UL-94 (Test for Flammability of Plastic Materials for Parts in Devices and Appliances UL-94, Fourth Edition).

Brief Summary Text (37):

The flame-retardant resin composition of the invention may contain conventional additives and fillers for resin within the ranges of amounts which do not adversely affect the desired properties. Examples of useful additives include flame retardants other than the halogen-free phosphazene compounds, UV absorbers, light stabilizers, antioxidants, light screens, metal deactivators, quenching agents, heat resistance stabilizers, lubricants, mold releasing agents, coloring agents, antistatic agents, antiaging agents, plasticizers, impact strength improving agents, compatibilizers and the like. Useful fillers include, for example, mica, kaolin, talc, silica, clay, calcium carbonate, calcium sulfate, calcium silicate, glass beads, glass balloons, glass flakes, glass fibers, fibrous alkali metal salts of titanate acid (potassium titanate fibers, etc.), fibrous transition metal salts of boric acid (aluminum borate fibers, etc.), fibrous alkaline earth metal salts of boric acid (magnesium borate fibers, etc.), zinc oxide whiskers, titanium oxide whiskers, magnesium oxide whiskers, gypsum whiskers, aluminum silicate whiskers, calcium silicate whiskers, silicon carbide whiskers, titanium carbide whiskers, silicon nitride whiskers, titanium nitride whiskers, carbon fibers, alumina fibers, alumina-silica fibers, zirconia fibers, quartz fibers, metal fibers and the like. These additives and fillers can be used either alone or in combination.

## CLAIMS:

5. The composition according to claim 1, wherein the thermoplastic resin (A) is at least one resin selected from the group consisting of polyethylene, polypropylene, polyisoprene, polybutadiene, polystyrene, high impact-resistant polystyrene, acrylonitrile-styrene resin, acrylonitrile-butadiene-styrene resin, methyl methacrylate-butadiene-styrene resin, methyl methacrylate-acrylonitrile-butadiene-styrene resin, acrylonitrile-acrylic rubber-styrene resin, polyalkyl (meth)acrylate, aromatic polycarbonate,

polyphenylene ether, polyphenylene sulfide, polyether sulfone, polysulfone, polybutyrene terephthalate, polyethylene terephthalate, polyamide, polyether ketone, polyether ether ketone, polyamide imide, polyether imide, and polyimide.

6. The composition according to claim 5, wherein the thermoplastic resin (A) is at least one resin selected from the group consisting of aromatic polycarbonate, polybutyrene terephthalate, polyphenylene ether, acrylonitrile-butadiene-styrene resin, and high impact-resistant polystyrene.

9. The composition according to claim 2, wherein the thermoplastic resin (A) is at least one resin selected from the group consisting of polyethylene, polypropylene, polyisoprene, polybutadiene, polystyrene, high impact-resistant polystyrene, acrylonitrile-styrene resin, acrylonitrile-butadiene-styrene resin, methyl methacrylate-butadiene-styrene resin, methyl methacrylate-acrylonitrile-butadiene-styrene resin, acrylonitrile-acrylic rubber-styrene resin, polyalkyl (meth)acrylate, aromatic polycarbonate, polyphenylene ether, polyphenylene sulfide, polyether sulfone, polysulfone, polybutyrene terephthalate, polyethylene terephthalate, polyamide, polyether ketone, polyether ether ketone, polyamide imide, polyether imide, and polyimide.

10. The composition according to claim 9, wherein the thermoplastic resin (A) is at least one resin selected from the group consisting of aromatic polycarbonate, polybutyrene terephthalate, polyphenylene ether, acrylonitrile-butadiene-styrene resin, and high impact-resistant polystyrene.

13. The composition according to claim 3, wherein the thermoplastic resin (A) is at least one resin selected from the group consisting of polyethylene, polypropylene, polyisoprene, polybutadiene, polystyrene, high impact-resistant polystyrene, acrylonitrile-styrene resin, acrylonitrile-butadiene-styrene resin, methyl methacrylate-butadiene-styrene resin, methyl methacrylate-acrylonitrile-butadiene-styrene resin, acrylonitrile-acrylic rubber-styrene resin, polyalkyl (meth)acrylate, aromatic polycarbonate, polyphenylene ether, polyphenylene sulfide, polyether sulfone, polysulfone, polybutyrene terephthalate, polyethylene terephthalate, polyamide, polyether ketone, polyether ether ketone, polyamide imide, polyether imide, and polyimide.

14. The composition according to claim 13, wherein the thermoplastic resin (A) is at least one resin selected from the group consisting of aromatic polycarbonate, polybutyrene terephthalate, polyphenylene ether, acrylonitrile-butadiene-styrene resin, and high impact-resistant polystyrene.

17. The composition according to claim 4, wherein the thermoplastic resin (A) is at least one resin selected from the group consisting of polyethylene, polypropylene, polyisoprene, polybutadiene, polystyrene, high impact-resistant polystyrene, acrylonitrile-styrene resin, acrylonitrile-butadiene-styrene resin, methyl methacrylate-butadiene-styrene resin, methyl methacrylate-acrylonitrile-butadiene-styrene resin, acrylonitrile-acrylic rubber-styrene resin, polyalkyl (meth)acrylate, aromatic polycarbonate, polyphenylene ether, polyphenylene sulfide, polyether sulfone, polysulfone, polybutyrene terephthalate, polyethylene terephthalate, polyamide, polyether ketone, polyether ether ketone, polyamide imide, polyether imide, and polyimide.

18. The composition according to claim 17, wherein the thermoplastic resin (A) is at least one resin selected from the group consisting of aromatic polycarbonate, polybutyrene terephthalate, polyphenylene ether, acrylonitrile-butadiene-styrene resin, and high impact-resistant polystyrene.

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L13: Entry 2 of 18

File: USPT

May 27, 2003

DOCUMENT-IDENTIFIER: US 6569929 B2

TITLE: Method to prepare phosphoramides, and resin compositions containing them

Brief Summary Text (3):

Compounds containing phosphorus have been used in resin compositions for a variety of reasons. For example, various phosphites have been utilized to enhance the melt stability and/or color stability of resin compositions. Alternatively, various organic phosphate esters have been utilized in resin compositions to improve the flame resistance properties of the compositions and/or to enhance the melt flow characteristics of the compositions. Certain water soluble phosphoramides have also been used in the textile industry as flame retardant finishes for fabrics.

Detailed Description Text (36):

The compositions of the invention may contain essentially a single phosphoramide or a mixture of two or more different phosphoramides. When at least one phosphoramide having a glass transition temperature of at least about 0.degree. C. is used as a source of phosphorus in resin compositions, it was unexpectedly found that a higher heat deflection temperature of test specimens made from the resin composition could be obtained as compared to compositions containing an organophosphate known in the art for enhancing the processability and/or flame resistance characteristics of the composition.

Detailed Description Text (39):

In one embodiment resinous compositions of the invention contain a flame retarding and/or processability enhancing amount of at least one phosphoramide, or a mixture of (c) at least one phosphoramide and (d) at least one non-polymeric or polymeric phosphorus additive selected from the group consisting of organic phosphate esters, thiophosphate esters, phosphonate esters, thiophosphonate esters, phosphinate esters, thiophosphinate esters, phosphine oxides, and thiophosphine oxides. For convenience, compounds selected from group (d) are hereinafter referred to as "phosphorus additives". In various embodiments phosphorus additives are non-polymeric organic phosphate esters including, for example, alkyl phosphate esters, aryl phosphate esters, resorcinol-based phosphate esters, and bisphenol-based phosphate esters known in the art, including resorcinol bis(diphenyl phosphate) and bisphenol A bis(diphenyl phosphate).

Detailed Description Text (43):

The compositions of the invention may also contain other conventional additives including antistatic agents, stabilizers such as heat stabilizers and light stabilizers, inhibitors, plasticizers, flow promoters, fillers, mold release agents, impact modifiers, and anti-drip agents. The latter are illustrated by tetrafluoroethylene polymers or copolymers, including mixtures with such other polymers as polystyrene-co-acrylonitrile (sometimes referred to herein as styrene-acrylonitrile copolymer). Representative examples of fillers include glass fibers, carbon fibers, carbon nanotubes, carbon black, mica, clay, nanoclay, barium sulfate, antimony oxide, titanium dioxide, wollastonite, silica, and talc. Representative examples of mold release agents include pentaerythritol tetrastearate, octyl behenate, and polyethylene. Representative examples of impact modifiers include polybutene and core-shell materials such as poly(methyl methacrylate)-co-poly(butyl acrylate)-co-poly(dimethylsiloxane). In certain embodiments of the invention additives include low molecular weight hydrocarbons with molecular weight between about 500 and 1000 such as ARKON available from



Arakawa Chemical USA, and terpenephénols.

Detailed Description Text (44):

In one embodiment a characteristic of compositions of the invention is their improved high temperature properties. These are demonstrated by the fact that the decrease in glass transition temperature (T<sub>g</sub>) exhibited as a result of the incorporation of a phosphoramidate in the composition is substantially less than the corresponding decrease exhibited in blends containing, for example, phosphate esters such as bis(diaryl phosphates) of dihydroxyaromatic compounds. This is evident when a phosphoramidate is compared to the organic phosphate ester in amounts suitable to provide enhanced flame resistance when measured, for example, in the UL-94 test procedure. In the case of phase-separated blends such as polycarbonate-ABS blends, the decrease in T<sub>g</sub> is noted in the polycarbonate phase.

Detailed Description Text (46):

It has been shown, however, with respect to phosphoramidates employed according to the present invention that their superior properties of flame retardance and high temperature resistance are consistent. Thus, for example, proportions of the prior art additive resorcinol bis(di-2,6-xylyl phosphate) effective to confer a suitable flame-out time on certain resinous compositions are similar to those proportions of a typical bis(2,6-xylyl)-phosphoramidate at an essentially equivalent level of phosphorus, but the bisphosphoramidate has a substantially lower tendency to decrease heat deflection temperature (HDT) despite the slightly greater amount of the bulk additive.

Detailed Description Text (47):

It should be clear that the present invention also affords methods to increase the heat distortion temperature of flame resistant compositions containing an amount of a phosphorus-containing compound effective to render the composition a flame rating of in one embodiment at least V-2, in another embodiment of at least V-1, and in still another embodiment V-0, in the UL-94 protocol, wherein the method comprises combining at least one thermoplastic resin and at least one phosphoramidate having a glass transition temperature of in one embodiment at least about 0.degree. C., in another embodiment of at least about 10.degree. C., and in still another embodiment of at least about 20.degree. C., said phosphoramidate being substantially free of acidic, basic, or halide impurities, or their precursors. In one embodiment the invention also affords methods to increase the heat distortion temperature of chlorine-free and bromine-free, flame resistant compositions as described in the previous sentence. The method may be used to increase the heat distortion temperature of compositions containing essentially a single phosphoramidate, or a mixture of two or more different phosphoramidates. Compositions containing essentially a single phosphoramidate may be employed. Useful thermoplastic resins have been described herein. In various embodiments thermoplastic resins are polycarbonate, most especially bisphenol A-based polycarbonate, and blends of polycarbonate, especially polycarbonate-SAN-ABS blends and polycarbonate-ABS blends, in which the amount of ABS may typically vary from about 1 to about 45 wt. %. In one embodiment the phosphoramidate is N,N'-bis-[di-(2,6-xylyl)-phosphoryl]piperazine. The method may further comprise at least one phosphorus additive selected from the group consisting of organic phosphate esters, thiophosphate esters, phosphonate esters, thiophosphonate esters, phosphinate esters, thiophosphinate esters, phosphine oxides, and thiophosphine oxides. In various embodiments the phosphorus additive is a non-polymeric organic phosphate ester. It should also be clear that the present invention includes compositions made by the methods as well as articles made from the compositions.

Detailed Description Text (54):

Blends of various amounts of a bisphenol A homopolycarbonate, 6.5 parts of a commercially available high rubber graft ABS copolymer and 9 parts of a commercially available SAN copolymer were prepared under identical conditions by blending in a Henschel mixer followed by extrusion on a twin screw extruder and were molded into test specimens. The blends also contained conventional additives including 0.4 part of polytetrafluoroethylene dispersed within styrene-acrylonitrile copolymer as an anti-drip agent, which were not considered in determining proportions, and various amounts of the following phosphoryl-based flame retardant additives:  
N,N'-bis-[di-(2,6-xylyl)phosphoryl]piperazine (XPP), a compound according to formula

VI: ##STR19## wherein each A moiety is a 2,6-dimethylphenoxy residue; N,N'-bis(neopentylendioxy phosphoryl)piperazine (NPP), a compound of similar structure but wherein each pair of A moieties on each phosphorus atom (e.g. the A.sup.3 and A.sup.4 pair) is a bridging neopentyloxy residue; N,N'-bis(diphenyl phosphoryl)piperazine (PPP), a compound of similar structure but wherein each A moiety is a phenoxy residue; and resorcinol bis(diphenyl phosphate) (RDP) and bisphenol A bis(diphenyl phosphate) (BPADP), two conventional phosphate esters. The FOT (total flameout times for first and second ignitions for 5 bars of 0.125 inch thickness) and Tg of the polycarbonate phase of each test specimen was determined and the results are given in Table I.

Detailed Description Text (55):

It is apparent that the compositions of this invention had an significantly reduced FOT and a Tg that differed from that of polycarbonate (147.degree. C.) in a base composition not containing a phosphoramidate or phosphate ester by an acceptable increment. Sample 2 had a Tg essentially equal within experimental error to that of the polycarbonate in the base composition but the FOT was appreciably higher than that obtained with XPP. Sample 3 utilizing PPP had a significantly lower Tg than that of XPP and NPP. It was unexpected that XPP-containing compositions (e.g., sample 1) would exhibit such superior FOT as compared to NPP-containing compositions (e.g., sample 2), and such a large increase in polycarbonate Tg as compared to PPP-containing compositions (e.g., sample 3). Samples 4 and 5, employing conventional flame retardants (FR), had unacceptably low Tg's for many commercial applications. The variations in FR content in terms of phr of total FR and of phosphorus are not considered significant from the standpoint of properties.

Detailed Description Text (94):

Blends with compositions as in Example 1 containing about 71-77 parts of a bisphenol A homopolycarbonate, 6.5 parts of a commercially available high rubber graft ABS copolymer and 9 parts of a commercially available SAN copolymer are prepared under identical conditions by blending in a Henschel mixer followed by extrusion on a twin screw extruder and are molded into test specimens. The blends contain various amounts of phosphorus-containing flame retardants such that the total amount of phosphorus by weight in the composition is between about 1.01% and 1.04%. The blends also contain conventional additives including 0.4 part of polytetrafluoroethylene dispersed within styrene-acrylonitrile copolymer as an anti-drip agent. The following phosphoryl-based flame retardant additives are employed: a mixed aryloxy compound according to formula VI: ##STR20## wherein the A moiety is derived from a 90/10 mixture of 2,6-xyleneol/phenol residues (hereinafter referred to as mixed aryloxy compound); N,N'-bis(neopentylendioxy phosphoryl)piperazine (NPP), a compound of similar structure but wherein each pair of A moieties on each phosphorus atom (e.g. the A.sup.3 and A.sup.4 pair) is a bridging neopentyloxy residue; N,N'-bis(diphenyl phosphoryl)piperazine (PPP), a compound of similar structure but wherein each A moiety is a phenoxy residue; and resorcinol bis(diphenyl phosphate) (RDP) and bisphenol A bis(diphenyl phosphate) (BPADP), two conventional phosphate esters. The FOT (total flameout times for first and second ignitions for 5 bars of 0.125 inch thickness) and Tg of the polycarbonate phase of each test specimen are determined. The compositions containing the mixed aryloxy compound have an significantly reduced FOT and a Tg that differs by an acceptable increment from that of polycarbonate (147.degree. C.) in a base composition as in Example 1 not containing a phosphoramidate or phosphate ester. The composition containing the mixed aryloxy compound exhibits superior FOT as compared to the NPP-containing composition and shows a large increase in polycarbonate Tg as compared to the PPP-containing composition. The samples employing conventional flame retardants (FR) have lower Tg's than the corresponding Tg for the sample containing the mixed aryloxy compound. The variations in FR content in terms of phr of total FR and of phosphorus are not considered significant from the standpoint of properties.

CLAIMS:

22. The composition of claim 19 wherein the thermoplastic resin is selected from the group consisting of (i) polycarbonate resins and blends containing at least one polycarbonate resin, (ii) polyphenylene ether resins and blends containing at least one polyphenylene ether resin, (iii) polystyrene resin and blends containing polystyrene resin, (iv) styrene-containing copolymer resin and blends containing

styrene-containing copolymer resin; (v) styrene-containing graft copolymer resin and blends containing styrene-containing graft copolymer resin; and (vi) high impact polystyrene resin and blends containing high impact polystyrene resin.

23. The composition of claim 19 wherein the thermoplastic resin is selected from the group consisting of high impact polystyrene resin, syndiotactic polystyrene, polyphenylene ether/high impact polystyrene resin blends, polyphenylene ether/syndiotactic polystyrene resin blends, polycarbonate-SAN blends, polycarbonate-ABS blends, polycarbonate-SAN-ABS blends, and polycarbonate-polyester blends.

24. The composition of claim 19 wherein the thermoplastic resin is at least one of polycarbonates, polyphenylene ethers, high impact polystyrenes, syndiotactic polystyrenes, acrylonitrile-butadiene-styrene copolymers, and styrene-acrylonitrile copolymers.

25. The composition of claim 19 wherein the thermoplastic resin comprises at least one polycarbonate and ABS.

26. The composition of claim 25 wherein the at least one polycarbonate comprises bisphenol A polycarbonate and a copolycarbonate of bisphenol A and 4,4'-(3,3,5-trimethylcyclohexylidene)diphenol.

42. A resin composition comprising the following and any reaction products thereof: a) at least one thermoplastic resin selected from the group consisting of (i) polycarbonate resins and blends containing at least one polycarbonate resin, (ii) polyphenylene ether resins and blends containing at least one polyphenylene ether resin, (iii) polystyrene resin and blends containing polystyrene resin, (iv) styrene-containing copolymer resin and blends containing styrene-containing copolymer resin; (v) styrene-containing graft copolymer resin and blends containing styrene-containing graft copolymer resin; and (vi) high impact polystyrene resin and blends containing high impact polystyrene resin, and b) at least one phosphoramidate of the formula: ##STR25## having a glass transition temperature of at least about 0.degree. C., wherein each Q.sup.1 is oxygen; and each of A.sup.3-6 is independently an aryloxy moiety with at least two substituents on each aromatic ring ortho to the oxygen linkage, wherein the phosphoramidate is made by the method of claim 37.

43. The composition of claim 42 wherein the thermoplastic resin is selected from the group consisting of high impact polystyrene resin, syndiotactic polystyrene, polyphenylene ether/high impact polystyrene resin blends, polyphenylene ether/syndiotactic polystyrene resin blends, polycarbonate-SAN blends, polycarbonate-ABS blends, polycarbonate-SAN-ABS blends, and polycarbonate-polyester blends.

44. The composition of claim 43 wherein the thermoplastic resin comprises at least one polycarbonate and ABS.

45. The composition of claim 44 wherein the polycarbonate comprises at least one of bisphenol A polycarbonate or a copolycarbonate of bisphenol A and 4,4'-(3,3,5-trimethylcyclohexylidene)diphenol.

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L13: Entry 1 of 18

File: USPT

Jul 22, 2003

DOCUMENT-IDENTIFIER: US 6596199 B2

TITLE: Carbon-reinforced PC-ABS composition and articles made from sameBrief Summary Text (24):

In addition to carbon fibers as described above, the compositions of the invention may include additional fillers. Non-limiting examples of other fillers which may be included are glass fibers, mica, talc, clay and wollastonite. Minor amounts of other materials can also be included to modify specific properties of the composition. For example, polytetrafluoroethylene (PTFE) in amounts of up to about 1% could be included as part of a flame retardant package. Other types of flame retardant packages including brominated flame retardant polymers (e.g., brominated PC) or phosphorus-containing organic flame retardants (such as resorcinol diphosphate, bisphenol A diphosphate or tetraxyl piperazine diphosphamide) can also be included in effective amounts up to about 20%. PTFE could also be included in larger amounts, up to about 25%, to improve wear resistance; and polyethylene could be included in amounts up to about 2% to improve mold release characteristics. Impact modifiers such as styrene-butadiene-styrene (SBS) can be included in amounts up to about 10% to further improve impact strength. Flow promoters such as hydrogenated polyterpene can also be included in amounts up to about 10%.

## CLAIMS:

1. A composition comprising: (a) a thermoplastic resin comprising a blend of polycarbonate and acrylonitrile-butadiene-styrene copolymer; and (b) carbon fibers associated into bundles with a polyamide terpolymer binder, said bundles being dispersed within the thermoplastic resin wherein said composition has a surface resistivity below 10.sup.5 Ohm/Sq.

6. The composition of claim 1, wherein the blend comprises polycarbonate and acrylonitrile-butadiene-styrene copolymer in a ratio of from 10:90 to 90:10, by weight.

9. A method for making an injection-molded article comprising the steps of: (a) preparing a composition comprising a thermoplastic resin comprising a blend of polycarbonate and acrylonitrile-butadiene-styrene copolymer, and carbon fibers associated into bundles with a polyamide terpolymer binder, said bundles being dispersed within the thermoplastic resin; (b) heating the composition to melt the thermoplastic resin; and (c) injecting the heated composition into a mold shaped to form the article wherein said injection-molded article has a surface resistivity below 10.sup.5 Ohm/Sq.

12. The method of claim 9, wherein the blend comprises polycarbonate and acrylonitrile-butadiene-styrene copolymer in a ratio of from 10:90 to 90:10 by weight.

13. An injection-molded article prepared by a method comprising the steps of: (a) preparing a composition comprising a thermoplastic resin comprising a blend of polycarbonate and acrylonitrile-butadiene-styrene copolymer, and carbon fibers associated into bundles with a polyamide terpolymer binder, said bundles being dispersed within the thermoplastic resin; (b) heating the composition to melt the thermoplastic resin; and (c) injecting the heated composition into a mold shaped to form the article wherein said injection-molded article has a surface resistivity

below  $10 \times 10^5$  Ohm/Sq.

16. The article of claim 13, wherein the blend comprises polycarbonate and acrylonitrile-butadiene-styrene copolymer in a ratio of from 10:90 to 90:10 by weight.

17. A method for increasing the impact strength of a PC-ABS blend having carbon fibers dispersed therein, comprising the step of coating the carbon fibers with a polyamide terpolymer binder prior to dispersing them in the PC-ABS blend, wherein the PC-ABS blend having carbon fibers has a surface resistivity below  $10 \times 10^5$  Ohm/Sq.

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L12: Entry 1 of 2

File: USPT

Mar 25, 2003

US-PAT-NO: 6537472

DOCUMENT-IDENTIFIER: US 6537472 B2

TITLE: Process for producing a cushioning article

DATE-ISSUED: March 25, 2003

US-CL-CURRENT: 264/45.3; 264/300, 264/328.12, 264/51, 264/54APPL-NO: 09/ 793094 [PALM]

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## FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
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JP	2000-053272	February 29, 2000

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L13: Entry 11 of 18

File: USPT

Jun 6, 2000

DOCUMENT-IDENTIFIER: US 6071992 A

TITLE: Flame-retardant thermoplastic resin composition

Brief Summary Text (2):

The present invention relates to an excellent flame-retardant thermoplastic resin composition, and more particularly, it relates to a thermoplastic resin composition having an excellent flame-retardant property, comprising an aromatic polycarbonate resin, a rubber-reinforced thermoplastic resin, a phosphate-based flame retardant and polytetrafluoroethylene, and capable of producing a molded product which is excellent in physical properties and flame-retardant property.

Brief Summary Text (9):

It is an object of the present invention to provide a flame-retardant thermoplastic resin composition which comprises a polycarbonate resin, a rubber-reinforced thermoplastic resin, phosphate and polytetrafluoroethylene, and is excellent in flame-retardant property, impact resistance, heat resistance, moldability and mold-stain resistance.

Brief Summary Text (44):

The amount of the phosphate (C) blended is 5 to 30 parts by weight, preferably 5 to 25 parts by weight, more preferably 5 to 22 parts by weight based on 100 parts by weight of the (A) to (C) components. When the amount of the phosphate (C) blended is less than 5 parts by weight, flame-retardant property may not be imparted to the resin composition. On the other hand, when the amount of the phosphate (C) blended is more than 30 parts by weight, the heat resistance of the obtained resin composition may be considerably deteriorated.

Brief Summary Text (49):

The flame-retardant thermoplastic resin composition according to the present invention may further contain fillers in order to enhance mechanical properties thereof. Examples of such fillers may include glass fibers, carbon fibers, metal fibers, metal flakes, glass beads, wollastonite, glass milled fibers, rock fillers, glass flakes, calcium carbonate, talc, mica, kaolin, barium sulfate, graphite, molybdenum disulfide, magnesium oxide, zinc oxide, zinc oxide whiskers, potassium titanate whiskers, glass balloons or ceramic balloons, or the like. These fillers may be used singly or in the form of a mixture of any two or more thereof.

Detailed Description Text (35):

On the other hand, as is apparent from Tables 3 and 4, in Comparative Examples 4 and 16, since the amount of vinylcyanide monomer grafted was zero, the obtained resin compositions showed a low impact resistance and further a deteriorated flame-retardant property. Conversely, in Comparative Examples 1 to 3, 5 to 6 and 17, since the amount of vinylcyanide monomer grafted was too large, the obtained resin compositions showed a low moldability and were deteriorated in mold-stain resistance and flame-retardant property. In Comparative Example 7, since the amount of polycarbonate resin blended was too small, the obtained resin composition showed a low heat resistance. Conversely, in Comparative Example 8, since the amount of polycarbonate resin blended was too large, the obtained resin composition showed a low moldability and a deteriorated mold-stain resistance. In Comparative Example 9, since the amount of rubber-reinforced thermoplastic resin blended was too small, the obtained resin composition showed a low impact resistance. Conversely, in Comparative Examples 10 and 11, since the amount of rubber-reinforced thermoplastic

resin blended was too large, the obtained resin compositions were deteriorated in flame-retardant property. In Comparative Example 12, since the amount of phosphate blended was too small, the obtained resin composition was deteriorated in flame-retardant property, moldability and mold-stain resistance. Conversely, in Comparative Example 13, since the amount of phosphate blended was too large, the obtained resin composition was deteriorated in heat resistance and impact resistance. In Comparative Example 14, since the amount of polytetrafluoroethylene blended was too small, the obtained resin composition was deteriorated in flame-retardant property. Conversely, in Comparative Example 15, since the amount of polytetrafluoroethylene blended was too large, it was difficult to extrude the obtained resin composition into pellets.

## CLAIMS:

1. A flame-retardant thermoplastic resin composition consisting essentially of the following components (A) to (D):

(A) 50 to 80 parts by weight of an aromatic polycarbonate resin;

(B) 5 to 40 parts by weight of a rubber-reinforced thermoplastic resin prepared by graft-polymerizing monomer components comprising an aromatic vinyl monomer, a vinylcyanide monomer and optionally other copolymerizable vinyl-based monomers, with a rubber polymer, the amount of said vinylcyanide monomer used being not less than 0.5% by weight and less than 5% by weight based on the total weight of said monomer components;

(C) 5 to 30 parts by weight of phosphate represented by the formula (I): ##STR4## wherein R<sup>sup.1</sup> to R<sup>sup.3</sup> are the same or different and are independently an alkyl group having 1 to 10 carbon atoms or an aryl group having 6 to 20 carbon atoms; and n is 0 or 1,

the total amount of the (A), (B) and (C) components being 100 parts by weight; and

(D) 0.02 to 3 parts by weight of polytetrafluoroethylene based on the total weight of the (A), (B) and (C) components.

6. A flame-retardant thermoplastic resin composition according to claim 1, wherein the component (B) is at least one resin selected from the group consisting of acrylonitrile-butadiene-styrene copolymer, methyl methacrylate-acrylonitrile-butadiene rubber-styrene copolymer, acrylonitrile-acrylic rubber-styrene copolymer, acrylonitrile-(ethylene-propylene-diene terpolymer)-styrene copolymer, acrylonitrile-silicone rubber-styrene copolymer and mixtures of these copolymers, and the amount of acrylonitrile used is not less than 0.5% and less than 5% by weight based on the total weight of monomer components other than rubbers.

7. A flame-retardant thermoplastic resin composition according to claim 1, wherein said rubber-reinforced thermoplastic resin (B) is at least one resin selected from the group consisting of acrylonitrile-butadiene-styrene copolymer, methyl methacrylate-acrylonitrile-butadiene rubber-styrene copolymer, acrylonitrile-acrylic rubber-styrene copolymer and acrylonitrile-(ethylene-propylene-diene terpolymer)-styrene copolymer.

8. A flame-retardant thermoplastic resin composition according to claim 1, wherein said component (B) is acrylonitrile-butadiene-styrene copolymer.

9. A flame-retardant thermoplastic resin composition according to claim 1, wherein said phosphate (C) is at least one compound selected from the group consisting of triphenyl phosphate, crezyldiphenyl phosphate, tricrezyl phosphate, trixylyl phosphate, crezyldiphenyl phosphate, trihydroxyphenyl phosphate, trimethyl phosphate and tert-butylphenyl diphenyl phosphate.



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L13: Entry 12 of 18

File: USPT

Nov 30, 1999

DOCUMENT-IDENTIFIER: US 5994463 A

TITLE: Polycarbonate/graft polymer moulding compositions with reduced deposit formation

Brief Summary Text (81):

In addition to the additives mentioned, the moulding compositions according to the invention may also contain stabilisers, pigments, fillers and reinforcing fillers. Preferred fillers are glass beads, mica, silicates, quartz, talcum, titanium dioxide or wollastonite. Preferred reinforcing fillers are glass or carbon fibres.

Detailed Description Text (9):

D1: flame retardant: triphenyl phosphate, Disflamoll.RTM. TP from Bayer AG, Leverkusen, Germany

Detailed Description Text (10):

D2: flame retardant: resorcinol oligophosphate, Fyrolflex.RTM. RDP from AKZO Nobel Chemicals GmbH, Duren, Germany

## CLAIMS:

1. Thermoplastic polycarbonate/graft polymer moulding compositions containing,

A) 5 to 95 parts by weight of an aromatic polycarbonate,

B) 1 to 50 parts by weight of at least one thermoplastic homopolymer, copolymer or terpolymer of styrene, .alpha.-methylstyrene, acrylonitrile, N-substituted maleimide or mixtures thereof,

C) 1 to 50 parts by weight of at least one graft polymer of

C.1) 5 to 90 parts by weight of styrene, .alpha.-methylstyrene, acrylonitrile, N-substituted maleimide or mixtures thereof, on

C.2) 95 to 10 parts by weight of a rubber with a glass transition temperature .ltoreq.0.degree. C.

and

D) 1 to 25 parts by weight (per 100 parts by weight A+B+C) of at least one additive selected from the group of flame retardants, lubricants, antistatic agent, mould release agents or mixtures thereof,

characterised in that the component B) is produced by bulk, solution or suspension polymerisation and has an oligomer content (dimers, trimers, tetramers) .ltoreq.1 wt. %, component C) is produced by emulsion polymerisation and the total oligomer content of the moulding compositions is .ltoreq.0.6 wt. %.

2. Thermoplastic polycarbonate-ABS moulding compositions according to claim 1, containing

A) 10 to 90 parts by weight of an aromatic polycarbonate,

B) 1 to 40 parts by weight of at least one thermoplastic homopolymer, copolymer or terpolymer of styrene, .alpha.-methylstyrene, acrylonitrile, N-substituted maleimide or mixtures thereof,

C) 2 to 40 parts by weight of at least one graft polymer of

C. 1) 30 to 80 parts by weight of styrene, .alpha.-methylstyrene, acrylonitrile, N-substituted maleimide or mixtures thereof, on

C.2) 70 to 20 parts by weight of a rubber with a glass transition temperature .ltoreq.0.degree. C. and

D) 2 to 20 parts by weight (per 100 parts by weight A+B+C) of at least one additive selected from the group of flame retardants, lubricants, antistatic agent, mould release agents or mixtures thereof,

characterised in that the component B) is produced by bulk, solution or suspension polymerisation and has an oligomer content (dimers, trimers, tetramers) .ltoreq.0.75 wt. %, component C) is produced by emulsion polymerisation and the total oligomer content of the moulding compositions is .ltoreq.0.4 wt. %.